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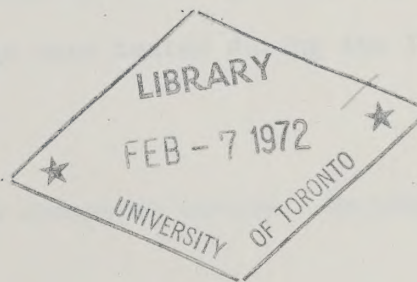
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REPORTING OF DATES IN THE 1967 LONDON TEST

by

Mercedes Rivera



Working Paper (Demographic and Socio-Economic Series) No. 7

Ottawa, April 1970



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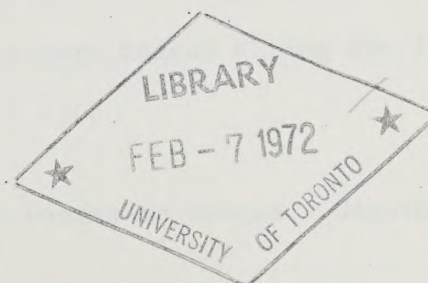
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Data on age collected from census questionnaires or any other survey are subject to certain types of error. In every population there are persons who give inconsistent answers about their age or date of birth. Certain dates or ages may be preferred by some people. In the United States, for example, there has been heaping at ages 21 and 65. Over and under-reporting has also been found on data re: age at first marriage. There are several methods to find what the errors are and how to graduate or smooth the data. Given the importance of age, misreporting may affect many cross-tabulations where age is an important element.

Age at census or at first marriage for the London Test, 1967, was calculated from answers to the question on month and year of birth or of first marriage. Data from questions on date of first marriage and date of birth of the last born child were collected for women ever married and on a sample basis. All the data used in this analysis related to marriage or fertility represent about 1/10 of the data collected from the London Test and about 1/3 of the data for women ever married collected from other tests.

Innovations such as self-enumeration, self-coding, sampling and reporting of date of an event rather than completed age were tested during the 1967 census test.

Reporting of age has improved from census to census. Heaping at ages ending in 0, 5 and 2 has declined.(1)

Some assumptions that we will attempt to prove using census test data can be made about age reporting:

1. Age heaping is in general less pronounced when date of birth is asked rather than actual age at last birthday. Heaping has been shifted, however, and

(1) For a complete account see Tetlock, G. (1969) Canada and Zelnik (1964, 439) and Myers (1940, 395-415) U.S.

preferred digits have to be measured either in terms of preferred digits in which years end or in terms of individual years of age.

2. The year when the census is taken may create heaping at certain ages. These ages would not have been over- or under-reported if age at last birthday had been asked.(2)
 3. Recent events may be remembered better, mainly when the event is fixed in time. A corollary of this could be that non-response increases as the person gets older.
 4. When asking for a date it may be better to provide for the exact decade and year of birth and for the exact month of birth rather than groups of months.
 5. If date of birth is misreported as a consequence, other dates are likely to be misreported as well. Date of birth forms the basis for deriving age at first marriage and age of last born child. Age at first marriage, for example, is calculated in terms of the years elapsed between date of birth of the person and month and year of marriage. Misreportings of date of birth will necessarily lessen the accuracy of derived data.
- Once the errors are located, techniques should be developed to eliminate or reduce the errors.

The data we shall analyse were derived from answers to questions in the 1967 London Test schedule. Reference will be made to data from other census tests such as the Toronto Test and the 1968 Fall Tests. Age at census was derived from responses to a question on date of birth. These data were collected on a 100 per cent basis and were computer processed after the edit programme was completed. Date of first marriage and date of birth of the last born child were collected on a sample basis. From this sample data another sample was drawn and data were

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- (2) The biases introduced when age at last birthday rather than date of birth is asked are of different nature. This paper is not an attempt to show the advantages of alternative wordings of the questions on age.

tallied manually.

There are two evaluation studies related to age reporting. Gower's (1968) study on Comparative Rates of Partial Non-Response, Mail Returns on the London and Toronto Tests deals with response rates from a sample of documents. The study covers all the census questions. Tetlock's study (1969) deals specifically with the reporting of age in London, 1967. Tetlock analyses and compares reporting of age in 1961, 1966 and 1967 for the population of London by means of several techniques one of them being Myers' Blended Method. The latter study is helpful to clarify and expand points 1, 2 and 3 above. Gower's study provides some data that may clarify point 4. The present evaluation will cover points 1, 2, 3 and 4 mentioned above.

New patterns in Age Reporting

In order to test the assumption that heaping patterns have changed, the blending technique developed by Myers will be applied.

Briefly, this technique derives a "blended" population which is a weighted sum of the persons who reported ages ending in digits 0 to 9. Table V shows the age distribution by single years of age used for this analysis.

The underlying assumption made by Myers (1942) is that the "blended" sum at each terminal digit should be very close to 10 per cent. Data from several U.S. Censuses and age distributions from Life Tables were employed by Myers in testing the accuracy of his assumption. (Myers 1942, 412-415). Deviations from 10 per cent indicate preference or avoidance of certain digits.

Table I shows the measures of digit preference and avoidance as a result of applying the "blending" technique. The overall measure of over and under selection of particular digits in the Test census age distribution is the Index of Preference. This index is one half of the absolute sum of the deviations for each of the terminal digits.

TABLE I. Deviations from Ten Percent and Index of Preference

Terminal digit	Total		
	Blended population		
	Total product	Percentage distribution	Deviation from 10%
0	146,141	10.1	+ 0.1
1	141,942	9.8	- 0.2
2	142,652	9.8	- 0.2
3	145,452	10.0	-
4	147,465	10.2	+ 0.2
5	146,056	10.1	+ 0.1
6	145,969	10.1	+ 0.1
7	150,068	10.4	+ 0.4
8	138,114	9.5	- 0.5
9	144,150	10.0	-
Total	1,448,009	100.0	Index of preference 0.9

Source: Table I was computed from Table V "Population by single years of age, London Census Test, 1967".

Preference for certain digits in Table I is shown by a positive deviation from 10 per cent. Avoidance of a digit is represented in terms of a negative deviation from 10%. The greater the positive deviation from 10 per cent, the greater the heaping for the given digit.

If digit preferences were manifested in terms of terminal digits of years reported, we would expect that years ending in 0, 2 and 5 will be preferred.(3) Since the London Test took place at the end of 1967 (September) we assume that the digit preferred in terms of age would be 7 because people born in 1960, let us say,

(3) Turner (1958) pointed out that since the most familiar way of counting is with the base ten, heaping should occur at ages ending in multiples of ten, the next largest at multiples of five Refer to Stanley H. Turner's work on "Patterns of Heaping in the Reporting of numerical Data".

will be 7 years old if born between January and September 1960. Preference for years ending in 2 would be manifested at ages ending in 5. Preference for years ending in 5 would be manifested by heaping at ages ending in 2.

This, at least for heaping at ages ending in 7, is evident from Table I. The subject, however, as we will see later, is still open to discussion.

The index of preference for London, 1967, is only 0.9. This indicates that heaping is not a serious problem in this case. The "blending" technique has been used widely and the results presented here may be compared to the heaping shown in data from other censuses. In Table VII (appendix) some measures of digit preference for different countries are given. It should be noted that in obtaining the indices of preference shown in Table VII ages under 10 were excluded, as well as ages 90 and over.

It is clear from Table I that heaping occurred at ages ending in 7. To counter-balance preference for digit 7 under-reporting or avoidance of ages ending in 8 is also shown. No other significant patterns can be determined from this measure of heaping. Heaping at ages ending in 5 is minimal.

Differences in "heaping" by sex were also found. The steps followed to find the index of preference are given in the appendix, Tables VI and VIII. Although heaping is more pronounced for males than for females this is not very meaningful because we cannot determine the sex of the person who filled the questionnaire.

The age distribution of the population by sex is illustrated in the attached age pyramid, fig. 1. It is difficult to make even general assumptions from this pyramid about age reporting. Intervening variables such as migration, mortality or actually smaller or bigger cohorts must be taken into account in a more detailed analysis of age misreporting. The possible effect of migration can be seen by examining the age distribution in Table V.

It would be useful to find heaping or preference at individual ages, that is to analyse the heaping patterns by single years of age. This would permit us to know whether some ages ending in 7 are more affected than others. There are several techniques which could be used such as graduation, frequency distributions, etc. We could thus determine whether or not heaping occurred mainly at certain key ages, such as ages over 50, i.e., 57, 67, 77, 87 and so on.

Zelnik, for example, in his analysis of the 1960 U.S. Census figures on age found that (Zelnik, 1964, 439-442):

The major exception to the general improvement in age heaping occurred at age 59 for both sexes. In fact, heaping at age 59, not characteristic of earlier censuses, is the outstanding example of age preference in 1960. Age heaping errors at 59 are three times greater than at any earlier age among females, and four times greater than at any earlier age among males. The very pronounced heaping on age 59 is undoubtedly the result of the different age question asked in the 1960 census. Persons tabulated at age 59 in 1960 were those reporting their year of birth as 1900. The preference for the double-zero year apparently resulted in an overstatement of 1900 as year of birth which, when translated into age, resulted in the strong preference for age 59.

The argument of "year heaping" rather than "age heaping" cannot explain all of the changes in age preferences between 1950 and 1960, as illustrated by the avoidance in 1960 of most of the ages ending in 9 (i.e., for years of birth ending in 0, a digit which, in the past, has been heavily preferred). The preference on the average for 9 in 1960 indicated by Myers' "blended method" is almost solely a result of the heavy heaping on age 59. The phenomenon of age heaping and its measurement reflect more than the simple choosing of one digit and the avoidance of another. In general, however, apparent changes in age preferences between 1950 and 1960 presumably arise mainly from the change in age question and are, in effect, the result of continuations of past digital preferences.

Assumption 2 has been partly proven. Since the 1971 census will be taken in June this may eliminate part of the effect of heaping.

The Effect of Non-Response

There is no evidence from the results of Gower's study (1968) that recent events are reported better (date of first marriage as opposed to date of birth). We must keep in mind, however, that due to the importance of the question on date of birth follow-up is more strict for this question.

TABLE II. Partial Non-Response on Mail Returns, Tests Documents

Question description	Quest. No.	Size of base	Success					Fail or blank
			Total	Initial			Follow- up	
				Total	Resp.	Edit	Total	
London								
Written birth date	P4	533	99.4	98.5	98.5	—	1.1	0.6
Coded month of birth ...	P5	533	99.2	98.5	91.6	6.9	1.1	0.8
Coded decade of birth ..	P6	533	99.4	98.3	92.7	5.6	1.1	0.6
Coded year of birth	(1)							
Written date of marriage	P49	156	97.4	87.1	87.1	—	10.3	2.6
Coded month of marriage	P50	156	96.8	88.5	87.2	1.3	9.0	3.2
Coded decade of marriage	(2)							
Coded year of marriage	(2)							
Number of births	P51	156	95.5	85.9	84.6	1.3	10.3	4.5
Written birthdate of child	P52	135	95.6	85.9	85.2	0.7	9.6	4.4
Coded month of birth ...	P53	135	94.8	86.7	83.7	3.0	8.1	5.2
Coded decade of birth ..	(3)							
Coded year of birth	(3)							
Mini Toronto Form 2A								
Written birth date	P4	1096	99.7	97.4	94.7	2.6	2.4	0.3
Coded month of birth ...	P4	1096	99.5	98.2	94.0	4.2	1.4	0.5
Coded decade of birth ..	P4	1096	99.7	98.4	93.5	4.9	1.3	0.3
Coded year of birth	P4	1096	99.8	98.5	91.6	6.9	1.3	0.2
Written date of marriage	P48	320	96.2	90.6	84.1	6.6	5.6	3.8
Coded month of marriage	P48	320	95.9	90.9	82.8	8.1	5.0	4.1
Coded decade of marriage	P48	319	95.9	90.6	82.1	8.5	5.3	4.1
Coded year of marriage	P48	319	95.9	90.3	80.2	10.0	5.6	4.1
Number of births	P49	320	96.2	90.6	83.4	7.2	5.6	3.8
Written birthdate of child	P50	286	95.1	89.9	82.5	7.3	5.2	4.9
Coded month of birth ...	P50	286	95.1	89.9	81.5	8.4	5.2	4.9
Coded decade of birth ..	P50	286	95.1	89.9	80.8	9.1	5.2	4.9
Coded year of birth	P50	287	95.1	89.9	79.8	10.1	5.2	4.9

(1) Included in P6.

(2) Included in P50.

(3) Included in P53.

Source: This is part of Table 1 in Gower's (1968, 4) study.

It is difficult to draw conclusions from Table II. The conditions and the populations enumerated were different in both London and Toronto. Gower (1968, 2) made the remark that "since we are only studying mail returns, and since the rate of mail response was much lower in Toronto than in London, the Toronto returns probably represent a more select (co-operative) group than do the London". On the other hand the questions on age and on the other two dates are very similar in both tests.

Making some internal comparisons of Gower's data we find that in London the manual editing of data was higher for questions P5 and P6 than for P50 or P52 which are the other two questions on age. This means that the respondent coded better P50 and P52. This could be explained because the later questions are answered at the end of the questionnaire and presumably the respondent knows better how to code at this stage, in other words, the practice effect is being felt. However, we could assume that non-response is higher by the end of the questionnaire because of the fatigue inherent to such a long task. It is possible that the reason for better self coding in questions P50 and P52 is due to the way the coding positions were set up. Every month of the year was preceded by an entry while for the coding of date of birth months were grouped. This pattern under the column Edit is not observed for Toronto. The 1969 Trial Census will allow for the respondent to code his exact month of birth as well as the decade and the year and this aspect could be explored further.

It seems that response rates are sensitive to the way the question is worded. In Toronto for example in form 2B (maxi Toronto) the respondent was asked to first code the date of birth and at the end of the question to write the date. In form 2A (mini Toronto) and the 1967 London Test form the question was reversed, first the write-in and second the coded entry.

Gower's study shows a better response rate for the London Test and the Mini Toronto (Form 2A) where the initial success rate (Resp.) for P5 and P6 was over 90%. In the case of Maxi Toronto the initial success rate (Resp.) for P4 fluctuated between 89% and 91.6% (Gower, 1968, Table 1, 4).

The figures are small and the differences in percentage do not permit generalizations.

When tabulations were prepared using date of birth, date of first marriage and date of birth of the last born child the following rates were found for London:

TABLE III. Non-Response to Fertility Questions by Age, London 1967 Test

Age	Women ever married 15 years and over	Number and percentage(1) of non-response							
		P50 Date of first marriage		P51 Number of children ever born		P52(2) Date of birth of last born child		P50-P51 and P52(3)	
		No.	%	No.	%	No.	%	No.	%
15 and over	770	23	3.0	29	3.8	25	3.2	20	2.6
15-44	414	5	1.2	6	1.4	4	1.0	3	0.7
15-19	20	—	—	—	—	—	—	—	—
20-24	69	1	1.4	1	1.4	1	1.4	1	1.4
25-29	88	2	2.3	—	—	—	—	—	—
30-34	81	—	—	—	—	—	—	—	—
35-39	84	1	1.2	3	3.6	2	2.4	1	1.2
40-44	72	1	1.4	2	2.8	1	1.4	1	1.4
45 and over	354	17	4.8	21	5.9	19	5.4	16	4.5
45-49	70	2	2.9	4	5.7	3	4.3	2	2.9
50-54	62	1	1.6	1	1.6	1	1.6	1	1.6
55-59	55	2	3.6	3	5.4	3	5.4	1	1.8
60-64	45	4	8.9	4	8.9	4	8.9	4	8.9
65+	122	8	6.6	9	7.4	8	6.6	8	6.6
Age not stated	2	1	50.0	2	100.0	2	100.0	1	50.0

(1) The percentage of non-response is equivalent to Column Fail or Blank in Table II.

(2) Includes cases when there was an entry in P51 other than none but no entry in P52, it also includes cases when both P51, and P52 were blank, and when the three P50, P51 and P52 were blank.

(3) Cases when the 3 questions P50, P51 and P52 were blank.

The results are close to Gower's results. When questions P50, P51 and P52 are compared we note the higher rate of non-response for question P51 on number of children ever born. It is difficult to determine the base for P52 because when the question on number of children is not answered we do not know whether an answer should have been given in P52. The results in Table III show a higher rate of non-response to P52(1). In this case if P51 was blank and P52 was blank both were considered as blank.

The results for women 45 years old and over in a rural area are slightly different, as shown in Table IV which follows:

TABLE IV. Non-Response to Fertility Questions by Age
(Annapolis, Durham, Lethbridge and Napierville, 1968 Fall Tests)

Age	Total women ever married 45 years and over	Number and percentage(1) of non-response			
		Date of first marriage		Date of birth of last born child	
		No.	%	No.	%
45+	1,237	69	5.6	64	5.2
45-49	246	9	3.7	12	4.9
50-54	245	10	4.1	12	4.9
55-59	212	11	5.2	8	3.8
60-64	185	12	6.5	9	4.9
65+	349	26	7.4	23	6.6
Age not stated	1	1	100.0	—	—

(1) Percentages are horizontal.

This table shows that non-response increases with age, at least in the case of females ever married, 45 years old and over living in rural areas. This pattern was observed in Table III also. For the group of 1,237 women in rural areas the non-response is lower for the most recent event (date of birth of last born child). A more careful working of P51 could yield better results.

It would have been very useful to have complete data on age at first marriage for London 1967. This would have allowed us to find preferences at certain ages or dates of first marriage. Since the population studied consisted of 770 women ever married, sample variability and sample size in this case do not permit further analysis.

Conclusion:

Data summarized here clarified some of our assumptions. One point to keep in mind is that when age is derived from the date when the event took place "new biases" may be introduced and therefore if the errors are found to be significant new ways of analysing the data could be developed. The type of information requested and the wording of questions also has an effect on response rates.

Assumption 5 could not be evaluated. Nevertheless, it seems obvious that misreporting of age would affect related data and that in the case of age at first marriage any error may well be cumulative. Comparison of Census data on age at first marriage and similar data from Vital Statistics would be a way of evaluating the data.

Mr. Tetlock (1969) investigated how heaping at certain terminal digits has changed over time. We may assume that reporting of age has improved in general. We dealt with census test data only. Tetlock's study dealing with the test census question on age and with comparison of age reporting in different censuses (using the population of London as basis) clarifies other aspects related to the reporting of age and to the techniques employed to measure age heaping.

Digit preference is only one of the errors found in age data. Other studies on age that could be carried out are detailed analysis of heaping by single years of age; response rates to age questions by age; and in the case of date of birth of last born child, by age at first marriage; misreporting of persons (omission)

in certain ages or age groups, etc. Data on age from the 1969 Trial Census could be compared to data from past censuses.

Decisions could be made on how to tabulate and how to graduate the data once the problem of age misreporting and its magnitude is determined.

If assumptions 1 and 2 are correct we may expect that in 1971 the preferred digit in age reporting would be 1, and 2 or 0 would be most avoided among the digits. Analysis of data by single years of age from the 1967 London Test would show whether one particular age ending in 7 was preferred over all other ages and what age or ages are more affected by digit preference.

APPENDIX

DISTRIBUTION OF THE POPULATION
BY SINGLE YEARS OF AGE AND SEX, LONDON 1967

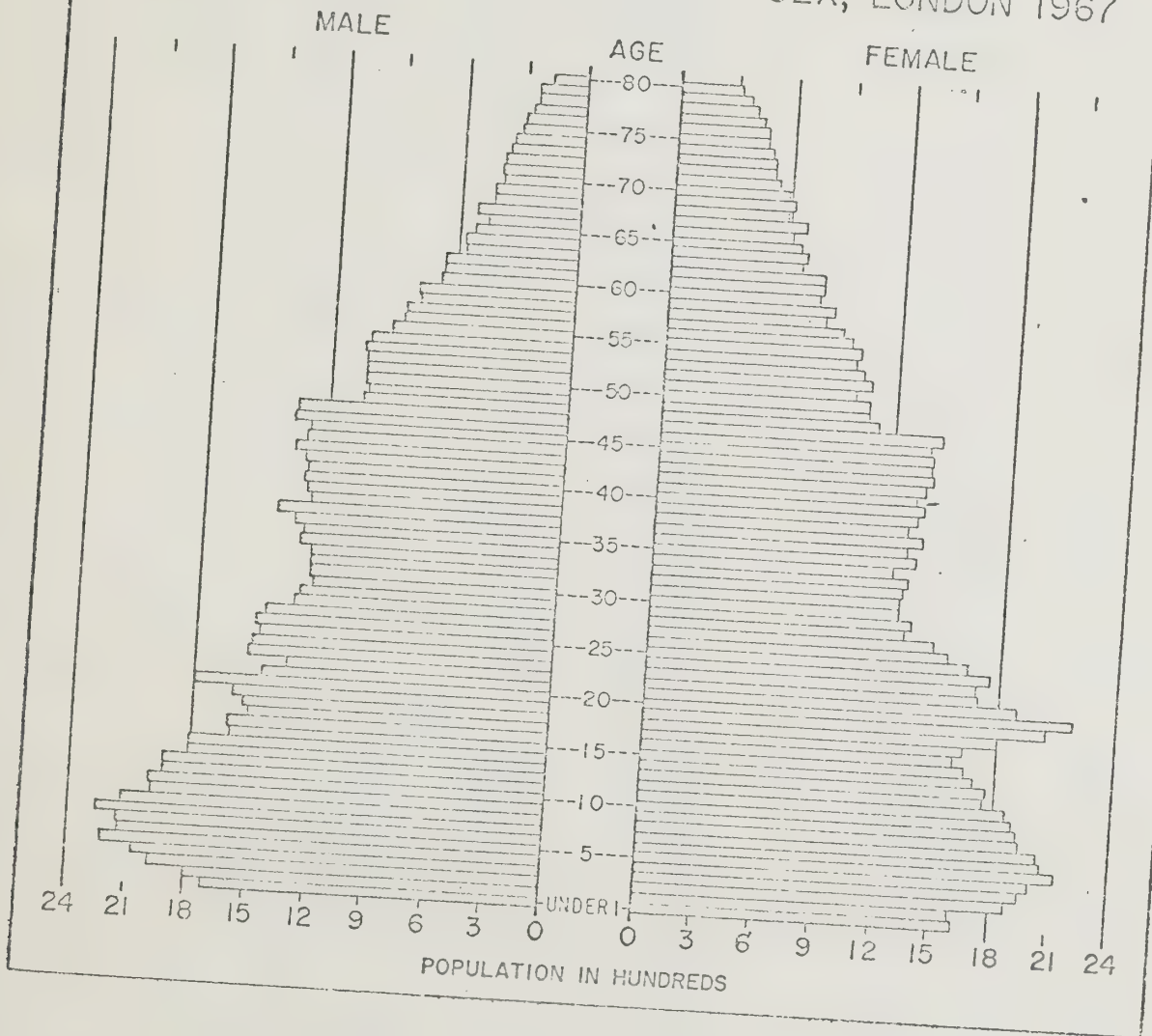


TABLE V. Population by Single Years of Age, London Census Test 1967

Age	Total	Male	Female	Age	Total	Male	Female
LONDON CITY	201,176	97,697	103,479				
Under 1	3,342	1,706	1,636	25	3,128	1,482	1,646
1	3,415	1,800	1,615	26	3,033	1,503	1,530
2	3,878	1,989	1,889	27	2,921	1,451	1,470
3	4,016	2,070	1,946	28	2,637	1,329	1,308
4	4,249	2,235	2,014	29	2,633	1,294	1,339
0-4	18,900	9,800	9,100	25-29	14,352	7,059	7,293
5	4,282	2,144	2,138	30	2,516	1,237	1,279
6	4,217	2,151	2,066	31	2,533	1,256	1,277
7	4,302	2,261	2,041	32	2,541	1,257	1,284
8	4,070	2,137	1,933	33	2,559	1,258	1,301
9	3,915	1,992	1,923	34	2,535	1,313	1,222
5-9	20,786	10,685	10,101	30-34	12,684	6,321	6,363
10	3,901	2,001	1,900	35	2,649	1,308	1,341
11	3,806	1,946	1,860	36	2,638	1,342	1,296
12	3,684	1,941	1,743	37	2,805	1,432	1,373
13	3,583	1,817	1,766	38	2,559	1,264	1,295
14	3,515	1,819	1,696	39	2,634	1,297	1,337
10-14	18,489	9,524	8,965	35-39	13,285	6,643	6,642
15	3,251	1,604	1,647	40	2,678	1,312	1,366
16	3,217	1,625	1,592	41	2,618	1,293	1,325
17	3,156	1,517	1,639	42	2,691	1,317	1,374
18	3,346	1,545	1,801	43	2,780	1,367	1,413
19	3,664	1,606	2,058	44	2,714	1,317	1,397
15-19	16,634	7,897	8,737	40-44	13,481	6,606	6,875
20	3,989	1,809	2,180	45	2,695	1,290	1,405
21	3,364	1,467	1,897	46	2,760	1,373	1,387
22	3,043	1,348	1,695	47	2,822	1,363	1,459
23	3,217	1,534	1,683	48	2,152	1,039	1,113
24	3,275	1,519	1,756	49	2,073	1,013	1,060
20-24	16,888	7,677	9,211	45-49	12,502	6,078	6,424

Source: Basic Tabulations, London City Census Test, 1967 "Population", Table A-1, DBS 1969 -- pp. 6, 7, 8.

TABLE V. Population by Single Years of Age, London Census Test 1967 — Concluded

Age	Total	Male	Female	Age	Total	Male	Female
50	2,094	1,026	1,068	75	792	316	476
51	2,008	1,025	983	76	776	306	470
52	2,085	1,020	1,065	77	708	263	445
53	2,058	1,030	1,028	78	637	233	404
54	1,976	1,001	975	79	602	239	363
50-54	10,221	5,102	5,119	75-79	3,515	1,357	2,158
55	1,907	901	1,006	80	499	188	311
56	1,805	855	950	81	493	187	306
57	1,757	848	909	82	409	159	250
58	1,585	770	815	83	352	116	236
59	1,636	782	854	84	346	126	220
55-59	8,690	4,156	4,534	80-84	2,099	776	1,323
60	1,462	687	775	85	288	92	196
61	1,468	678	790	86	248	95	153
62	1,471	673	798	87	250	100	150
63	1,258	578	680	88	186	62	124
64	1,288	585	703	89	106	35	71
60-64	6,947	3,201	3,746	85-89	1,078	384	694
65	1,196	533	663	90	103	19	84
66	1,085	471	614	91	66	20	46
67	1,219	532	687	92	61	14	47
68	1,044	447	597	93	43	10	33
69	1,067	443	624	94	35	10	25
65-69	5,611	2,426	3,185	90-94	308	73	235
70	986	396	590	95	22	5	17
71	949	404	545	96	16	3	13
72	920	392	528	97	19	5	14
73	888	360	528	98	1	1	—
74	855	347	508	99	8	2	6
70-74	4,598	1,899	2,699	95-99	66	16	50
				100	42	17	25

TABLE VI. Digit Preference as Shown from Age Data Collected for the Population in the 1967 London Test (For persons 10 years old and over)

Terminal digit	Number of persons at specified ages							Total 10-89	Coefficient	Product
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89		
0	3,901	3,989	2,516	2,678	2,094	1,462	986	499	1	18,125
1	3,806	3,364	2,533	2,618	2,008	1,468	949	493	2	34,478
2	3,684	3,043	2,541	2,691	2,085	1,471	920	409	3	50,532
3	3,583	3,217	2,559	2,780	2,058	1,258	888	352	4	66,780
4	3,515	3,275	2,535	2,714	1,976	1,288	855	346	5	82,520
5	3,251	3,128	2,649	2,695	1,907	1,196	792	288	6	95,436
6	3,217	3,033	2,638	2,760	1,805	1,085	776	248	7	108,934
7	3,156	2,921	2,805	2,822	1,757	1,219	708	250	8	125,104
8	3,346	2,637	2,559	2,152	1,585	1,044	637	186	9	127,314
9	3,664	2,633	2,634	2,073	1,636	1,067	602	106	10	144,150
Total	35,123	31,240	25,969	25,983	18,911	12,558	8,113	3,177		161,074
0		3,989	2,516	2,678	2,094	1,462	986	499	9	128,016
1		3,364	2,533	2,618	2,008	1,468	949	493	8	107,464
2		3,043	2,541	2,691	2,085	1,471	920	409	7	92,120
3		3,217	2,559	2,780	2,058	1,258	888	352	6	78,672
4		3,275	2,535	2,714	1,976	1,288	855	346	5	64,945
5		3,128	2,649	2,695	1,907	1,196	792	288	4	50,620
6		3,033	2,638	2,760	1,805	1,085	776	248	3	37,035
7		2,921	2,805	2,822	1,757	1,219	708	250	2	24,964
8		2,637	2,559	2,152	1,585	1,044	637	186	1	10,800
9		2,633	2,634	2,073	1,636	1,067	602	106	0	—
Total		31,240	25,969	25,983	18,911	12,558	8,113	3,177		125,951

TABLE VI. Digit Preference as Shown from Age Data Collected for the Population in the 1967 London Test (For Persons 10 years old and over) — Continued

MALES

Terminal digit	Number of persons at specified ages							Total 10-89	Coefficient	Product
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89		
0	2,001	1,809	1,237	1,312	1,026	687	396	188	1	8,656
1	1,946	1,467	1,256	1,293	1,025	678	404	187	2	16,512
2	1,941	1,348	1,257	1,317	1,020	673	392	159	3	24,321
3	1,817	1,534	1,258	1,367	1,030	578	360	116	4	32,240
4	1,819	1,519	1,313	1,317	1,001	585	347	126	5	40,135
5	1,604	1,482	1,308	1,290	901	533	316	92	6	45,156
6	1,625	1,503	1,342	1,373	855	471	306	95	7	52,990
7	1,517	1,451	1,432	1,363	848	532	263	100	8	60,048
8	1,545	1,329	1,264	1,039	770	447	233	62	9	60,201
9	1,606	1,294	1,297	1,013	782	443	239	35	10	67,090
Total	17,421	14,736	12,964	12,684	9,258	5,627	3,256	1,160		77,106
0		1,809	1,237	1,312	1,026	687	396	188	9	59,895
1		1,467	1,256	1,293	1,025	678	404	187	8	50,480
2		1,348	1,257	1,317	1,020	673	392	159	7	43,162
3		1,534	1,258	1,367	1,030	578	360	116	6	37,458
4		1,519	1,313	1,317	1,001	585	347	126	5	31,040
5		1,482	1,308	1,290	901	533	316	92	4	23,688
6		1,503	1,342	1,373	855	471	306	95	3	17,835
7		1,451	1,432	1,363	848	532	263	100	2	11,978
8		1,329	1,264	1,039	770	447	233	62	1	5,144
9		1,294	1,297	1,013	782	443	239	35	0	—
Total		14,736	12,964	12,684	9,258	5,627	3,256	1,160		59,685

TABLE VI. Digit Preference as Shown from Age Data Collected for the Population in the 1967 London Test (For Persons 10 years old and over) -- Continued

FEMALES

Terminal digit	Number of persons at specified ages							Total 10-89	Coefficient	Product
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89		
0	1,900	2,180	1,279	1,366	1,068	775	590	311	-1	9,469
1	1,860	1,897	1,277	1,325	983	790	545	306	2	17,966
2	1,743	1,695	1,284	1,374	1,065	798	528	250	3	26,211
3	1,766	1,683	1,301	1,413	1,028	680	528	236	4	34,540
4	1,696	1,756	1,222	1,397	975	703	508	220	5	42,385
5	1,647	1,646	1,341	1,405	1,006	663	476	196	6	50,280
6	1,592	1,530	1,296	1,387	950	614	470	153	7	55,944
7	1,639	1,470	1,373	1,459	909	687	445	150	8	65,056
8	1,801	1,308	1,295	1,113	815	597	404	124	9	67,113
9	2,058	1,339	1,337	1,060	854	624	363	71	10	77,060
Total	17,702	16,504	13,005	13,299	9,653	6,931	4,857	2,017		83,968
0		2,180	1,279	1,366	1,068	775	590	311	9	68,121
1		1,897	1,277	1,325	983	790	545	306	8	56,984
2		1,695	1,284	1,374	1,065	798	528	250	7	48,958
3		1,683	1,301	1,413	1,028	680	528	236	6	41,214
4		1,756	1,222	1,397	975	703	508	220	5	33,905
5		1,646	1,341	1,405	1,006	663	476	196	4	26,932
6		1,530	1,296	1,387	950	614	470	153	3	19,200
7		1,470	1,373	1,459	909	687	445	150	2	12,986
8		1,308	1,295	1,113	815	597	404	124	1	5,656
9		1,339	1,337	1,060	854	624	363	71	0	—
Total		16,504	13,005	13,299	9,653	6,931	4,857	2,017		66,266

TABLE VI. Digit Preference as Shown from Age Data Collected for the Population in the 1967 London Test (For Persons 10 years old and over) -- Concluded

DEVIATIONS FROM TEN PERCENT AND INDEX OF PREFERENCE

Terminal digit	Total				Male				Female			
	Blended population				Blended population				Blended population			
	Total product	Per-centage distribution	Deviation from 10%	Total product	Total product	Per-centage distribution	Deviation from 10%	Total product	Total product	Per-centage distribution	Deviation from 10%	Index of preference
0	146,141	10.1	+ 0.1	68,551	10.0	—	—	77,590	10.2	+ 0.2		
1	141,942	9.8	— 0.2	66,992	9.7	— 0.3	— 0.3	74,950	9.9	— 0.1		
2	142,652	9.8	— 0.2	67,483	9.8	— 0.2	— 0.2	75,169	9.9	— 0.1		
3	145,452	10.0	—	69,698	10.1	+ 0.1	+ 0.1	75,754	10.0	—		
4	147,465	10.2	+ 0.2	71,175	10.3	+ 0.3	+ 0.3	76,290	10.0	—		
5	146,056	10.1	+ 0.1	68,844	10.0	—	—	77,212	10.1	+ 0.1		
6	145,969	10.1	+ 0.1	70,825	10.3	+ 0.3	+ 0.3	75,144	9.9	— 0.1		
7	150,068	10.4	+ 0.4	72,026	10.5	+ 0.5	+ 0.5	78,042	10.3	+ 0.3		
8	138,114	9.5	— 0.5	65,345	9.5	— 0.5	— 0.5	72,769	9.6	— 0.4		
9	144,150	10.0	—	67,090	9.8	— 0.2	— 0.2	77,060	10.1	+ 0.1		
Total	1,448,009	100.0	Index of preference 0.9	688,029	100.0	Index preference 1.2		759,980	100.0	Index of preference 0.7		

TABLE VII. Indices of Preference, for Selected Populations(1)

Country	Index
United States, 1880	10.4
" 1890	7.8
" 1900	4.7
" 1910	5.6
" 1920	4.5
" 1930	4.3
" 1940	3.0
" 1950	2.2
" 1960	0.8
Sweden, 1960	0.4
Netherlands Antilles, 1960	1.0
Ryukyu Islands, 1960	1.3
Rhodesia and Nyassaland, 1956	1.4
Republic of Korea, 1955	1.4
Taiwan, 1956	1.6
Monaco, 1961	1.8
Bermuda, 1960	1.8
Western Samoa, 1961	2.0
Hong Kong, 1961	2.0
St. Pierre and Miquelo, 1962	2.2
Thailand, 1960	2.2
Singapore, 1957	2.2
Macau, 1960	2.7
Malta and Gozo, 1957	2.8
Turks and Caicos Islands, 1960	2.8
Bulgaria, 1956	3.1
Puerto Rico, 1960	3.5
Romania, 1956	3.6
Cayman Islands, 1960	4.0
Jamaica, 1960	5.4
Uganda, 1959	6.5
Fiji Islands, 1956	6.5
Seychelles, 1960	6.7
Federation of Malaya, 1957	8.2
Tanganyika, 1957	8.8
Philippines, 1960	10.1
Mexico, 1960	13.3
Ghana, 1960	15.7
Turkey, 1960	22.3

(1) These indices were computed by application of the blending technique to Census data.

Source: The indices for the United States were obtained from the U.S. Census of Population: 1960, Detailed Characteristics: United States summary, Bureau of the Census, P C (1) - 1D, Washington, 1963, p. XII. Indices of preference for the other countries were computed by Stockwell, E. (1965, 440-441). Stockwell (1965) employed the same ages that were used for our tables. The figures for the United States are based on ages 23 to 99. Op.Cit U.S. Census of Population, (1963, XII) "the reduction in the degree of age heaping in 1960 may be explained in part by greater accuracy in age reporting as a result of the introduction of year of birth in the questionnaire. The use of self-enumeration by means of the Advance Census Report may also have been conducive to more accurate age reporting. Still another factor may have been the higher non-response rate on the age item immediately preceding".

TABLE VIII. Application of Myers' Method of "Blending" to Age Data Collected for the Total Population in the 1960 Census of Mexico (Stockwell, 1965, 442)

Terminal digits	Number at specified ages								Sum for ages	
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	10-89	20-89
0	1,029,718	741,806	780,796	619,400	521,492	473,450	200,200	88,484	4,455,406	3,425,688.
1	756,819	449,264	237,792	106,534	94,500	46,045	20,313	7,520	1,718,787	961,968
2	948,976	631,145	407,655	289,035	179,693	89,935	52,712	13,514	2,612,665	1,663,689
3	814,823	571,535	333,444	188,088	131,504	69,421	31,757	9,537	2,150,109	1,335,286
4	807,980	553,262	291,948	158,347	136,170	65,859	28,389	9,283	2,051,238	1,243,258
5	753,742	706,091	592,958	431,949	283,510	191,430	88,484	26,625	3,074,789	2,321,047
6	703,138	474,468	324,719	184,203	145,273	60,826	28,812	8,169	1,947,608	1,244,470
7	703,225	443,467	276,213	158,776	99,482	48,671	19,474	6,115	1,755,423	1,052,198
8	798,608	533,010	441,177	290,396	165,741	78,878	36,715	7,616	2,352,141	1,553,533
9	576,552	357,856	267,613	168,284	105,893	34,359	14,288	4,891	1,529,736	953,184
Sum ...	7,893,581	5,461,964	3,972,315	2,595,012	1,863,258	1,158,874	521,144	181,754	23,647,902	15,754,321

Terminal digits	Ages 10-89				Ages 20-89				"Blended" population		
	Sum	Coef-ficient	Product	Sum	Coef-ficient	Product	Sum	Per cent distri-bution	Deviation from 10%		
1	4,455,406	1	4,455,406	3,425,688	9	30,831,192	35,286,598	17.8	+ 7.8		
2	1,718,787	2	3,437,574	961,968	8	7,695,744	11,133,318	5.6	- 4.4		
3	2,612,665	3	7,837,995	1,663,689	7	11,645,823	19,483,818	9.8	- 0.2		
4	2,150,109	4	8,600,436	1,335,286	6	8,011,716	16,612,152	8.4	- 1.6		
5	2,051,238	5	10,256,190	1,243,258	5	6,216,290	16,472,480	8.3	- 1.7		
6	3,074,789	6	18,448,734	2,321,047	4	9,284,188	27,732,922	14.0	+ 4.0		
7	1,947,608	7	13,633,256	1,244,470	3	3,733,410	17,366,666	8.8	- 1.2		
8	1,755,423	8	14,043,384	1,052,198	2	2,104,396	16,147,780	8.1	- 1.9		
9	2,352,141	9	21,169,269	1,553,533	1	1,553,533	22,722,802	11.5	+ 1.5		
0	1,529,736	10	15,297,360	953,184	0	0	15,297,360	7.7	- 2.3		
Sum								198,255,896	100.0	26.6	
Index of preference 13.3											

REFERENCES

- Gower, D.E. Comparative Rates of Partial Non-Response, Mail Returns on the London and Toronto Tests. Evaluation Memoranda (F5). DBS, 1968.
- Myers, Robert J. "Errors and Bias in the Reporting of Ages in Census Data." Actuarial Society of America, Transactions, 41 (October, 1940), 395-415.
- Stockwell, Edward G. "Digit Preference and Avoidance in the 1960 Census of Mexico." Estadistica, Vol. XXIII(88) (September, 1965), 438-448.
- Tetlock, George H. An Evaluation of the Accuracy of Age Reporting in the 1967 Census Test -- London, Evaluation Memoranda (D6). DBS, 1969.
- Turner, Stanley H. "Patterns of Heaping in the Reporting of Numerical Data." A.S.A. Proceedings of the Social Statistics Section (1958), 248-251.
- Zelnik, Melvin. "Errors in the 1960 Census Emumeration of Native Whites." Journal of the American Statistical Association, 59 (June, 1964), 437-459.

